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An overview of the most important medicinal plants affecting cardiac arrhythmia in Iran

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ABSTRACT

Oxidative stress occur in several diseases such as cardiovascular disease, diabetes, cancer, aging and Alzheimer's disease. Cardiac arrhythmia is today a common clinical problem presenting with decrease, increase or mismatch in normal heart rhythm that cause reduction in cardiac output. Given the importance of heart diseases and noting that in many countries, cardiovascular diseases are among the top causes of death and the leading cause of disability and the fact that application of medicinal plants and herbal medicines is common in the treatment of hypertension, ischemic heart disease, congestive heart disease, arrhythmias and angina pectoralis, therefore, this review aimed to identify the anti-arrhythmic medicinal plants indigenous in Iran. Due to the proven anti-arrhythmic effects of medicinal herbs including grape, sour orange, olive, pokeweeds and nettle and regarding the obvious phytochemical agents in them, so hesperidin, naringin, deosepyn, apigenin, aloroparin and hydroxytyrosol, phytolactosin, catechins, betacianin, tannins and free phenolic acids can be used as anti-arrhythmic ingredients used for the production of bioactive agents.

Keywords: Cardiovascular diseases, Arrhythmia, Traditional medicine, Medicinal herbs, Iran

INTRODUCTION

Oxidative stress occur in several diseases such as cardiovascular disease, diabetes, cancer, aging and Alzheimer's disease. Today, cardiac arrhythmia is a common clinical problem and is observed in 25% of patients treated with digitalis, 50% of patients under anesthesia and more than 80% of patients with acute myocardial infarction. Arrhythmias in form of decrease or increase in normal heart rhythm or rhythm mismatch decrease the cardiac output [1-5]. Some of these arrhythmias are very serious and can be fatal, if not controlled [6]. There are several types of arrhythmia [7]. Atrial fibrillation increases the risk of stroke and congestive heart failure, and mortality due to coronary artery disease [8]. Atrial and ventricular arrhythmias are the most common complications after surgery. Occurrence of arrhythmia, especially coronary artery fibrillation (CABG), as the most common disease, although does not increase the risk of mortality of AF patients, increases the length of stay in special care unit [9, 10]. Given the importance of heart diseases, it's notable that in many countries, cardiovascular diseases are among the top causes of death and a major cause of disability [11].

Medicinal plants are one of the most popular treatments in complementary medicine [12-27]. The use of medicinal plants were traditionally common in Iran [28-43]. These compounds have a natural origin [44-59] and have fewer side effects than chemical drugs [60-73]. In recent decades, people's tendency towards these drugs have increased

[74-85]. Biologic combinations with herbal origin are considered an important branch of drug treatment [86-96]. In many cases, medications with plant origin are less expensive and are associated with fewer side effects than chemical drugs [97-106]. Treatment with medicinal plants and herbal medicines are common in patients with hypertension, ischemic heart disease, congestive heart disease, arrhythmias and angina pectoralis [107]. Thus, the current review aimed to identify the anti-arrhythmic medicinal plants indigenous in Iran.

The information of the current review was obtained by searching keywords “cardiovascular diseases, arrhythmia, medicinal plant, extracts and essence” from scientific articles published in databases such as SID, Scopus, PubMed, Magiran, Google scholar and etc.

Iran's scientific literature review showed that 5 herbs (grape, sour orange, olive, pokeweeds and nettle) are used for the treatment of cardiac arrhythmias. Additional information affecting the plants are listed in Table 1.

Table 1. Antiarrhythmic medicinal plants in Iran

No.	Scientific name	Family name	English name	Explanation
1	<i>Vitis vinifera</i>	Vitaceae	Grape	Hydro-alcoholic perfusion of grape seed extract reduces the infarct size from 31 ± 5 to 12 ± 3 , 16 ± 6 and 2 ± 1 , respectively, for extract concentrations of 1, 10 and 100. Perfusion of concentration of 1 $\mu\text{g/L}$ of the extract reduces the number, duration and incidence of ischemic VT phase. So hydro-alcoholic perfusion of grape seed extract was proven effective in arrhythmia caused by ischemia-reperfusion in rat's heart in terms of reducing infarct size and arrhythmias [107].
2	<i>Citrus bigaradia</i>	Rutaceae	Sour orange	Hydro-alcoholic extract of sour orange has a biphasic dose-dependent pattern, as in low and medium concentrations (0.8 and 3.2 mg/mL), it reduces nodal and wenkebach refraction. Also, sour orange extract non-significantly reduces the average distance between two consecutive records of the his bundle and the amount of hidden beats in all concentration extract. This mechanism possibly acts through stimulation reduction and regional node refraction and hidden areas and partly through the beta-mediated receptors [108].
3	<i>Olea europaea</i> L.	Oleaceae	Olive	The gavage of 200 mg/kg of olive for 1, 3, 7, 14 and 28 days significantly decreased the severity of arrhythmias, including the number of premature ventricular beats (VEBs), incidence of ventricular tachycardia (VT) and ventricular fibrillation (VF) in the groups that received at least 14 days extract. Also, VT and VF frequency and time showed significant differences in groups of 14 and 28 days; ultimately, olive leaf extract help protect the heart [109].
4	<i>Phytolacca decandra</i> L.	Phytolaccaceae	Pokeweeds	The results of a study showed that extracts of phytolacca can be used to measure the kinetics of recovery atrioventricular node. Also it showed dose-dependent effect of the herb extract with effect on basic and functional index of the atrioventricular node in heart of rats and caused partial VWCL, AVCT depression and is effective on AV node refractory period. So, this plant has anti-arrhythmia supraventricular role [110].
5	<i>Urtica dioica</i> L.	Urticaceae	Nettle	Results of a study showed that a concentration of 1 g/L of ethanol extract of nettle significantly depresses the basic and functional properties of atrioventricular node, as it had a significant increase in Wenkebach indices and functional refractory period and nodal conduction time that shows anti-arrhythmic activity of hydro-alcoholic extract of nettle that is probably effective through the mechanism of energy-dependent communication with sodium-potassium pump inhibition and supraventricular treatment [111].

DISCUSSION

Cardiac arrhythmia is a common clinical problem today. Based on the obtained results, medicinal herbs including grape, sour orange, olive, pokeweeds and nettle herbs are used in the treatment of cardiac arrhythmias.

In traditional medicine, sour orange plant was used to treat headaches, chest pain, skin freshness, and as sedatives and tonics [112, 113]. The most important flavonoids of sour orange include hesperidin, naringin, deosopin, and apigenin [114]. Olive leaf was the traditional treatment for fever, malaria, hypertension, gout, diabetes and atherosclerosis [115, 116]. Olive is a rich source for polyphenols, especially oleoropin and its derivatives such as hydroxytyrosol [117-121]. Phytolacca was used in traditional medicine to treat rheumatism, ascorbate, dysmenorrhea, and constipation. It has been clarified that specified parts of phytolacca plant contain substances such as Fitolactocin, catechins, betacianin, tannins and free phenolic acids [122].

Regarding the antiarrhythmic effects of medicinal herbs including grape, sour orange, olive, pokeweeds and nettle, proven by clinical researches and considering their phytochemicals, hesperidin, Naringin, deoselin, apigenin, oleoropin, hydroxytyrosol, Fitolactocin, catechins, betacyanin, tannins and free phenolic acids can be used as antiarrhythmic active ingredients, used for the production of bioactive agents. Oxidative stress induces molecular oxidative damage, which in turn cause cellular dysfunction and impairment of organ function thus they involve in the pathogenesis of diseases [123-126]. Cardiac arrhythmia is associated with increase in free radicals and oxidative stress [127]. Medicinal plants introduced here mostly have antioxidant activities. Which may act, at least in part, by this way. There are a lot of other medicinal plants which have antioxidant properties [128-180]. These herbs may also have anti-arrhythmic activities which worth examining.

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